

# PATENT ABSTRACTS OF JAPAN

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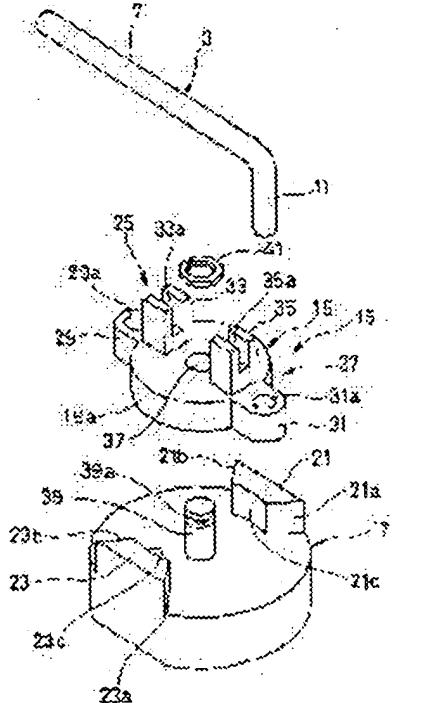
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## (54) LIQUID LEVEL SENSOR

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To support a liquid level sensor by one kind of float arm by selectively switching between the left and right two directions.

**SOLUTION:** This liquid level sensor is equipped with a float arm 3 and stoppers 21, 23. The flat arm 3, having a float on one end, with the other end supported in an upward/downward rotatable manner on a rotary support part 15 rotates upward/downward in compliance with vertical motion of the float following the rise/fall of a liquid level. The stoppers 21, 23 regulate the range of upward/downward rotation of the arm 3 according to a specific amount of liquid. This level sensor is characterized in that the support part 15 is formed as an arm holder 19 supported in an upward/downward rotatable manner on a sensor frame 17 and capable of supporting the float arm 3 in either of the left and right two directions by selectively switching between the directions, and that the stoppers 21, 23 are disposed for regulating the rotation range of the float arm 3 in either direction.



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**CLAIMS****[Claim(s)]**

[Claim 1] The float arm which an end is equipped with a float, the other end is supported by the rotation supporter free [ vertical rotation ], and the float accompanying the oil-level upper and lower sides responds up and down; and carries out vertical rotation, In the surface level sensor equipped with the stopper which specifies the range of vertical rotation of said float arm according to specific volume A sensor frame supports said rotation supporter free [ vertical rotation ], said float arm is alternatively changed to right-and-left both directions, and it considers as the arm holder which can be supported. Said stopper The surface level sensor characterized by having been arranged possible [ a convention of the range ] also for any of said changed float arm.

[Claim 2] It is the surface level sensor characterized by being a surface level sensor according to claim 1, and equipping said arm holder with the arm attaching part of two right and left.

[Claim 3] It is the surface level sensor which is a surface level sensor according to claim 2, and is characterized by said arm electrode holder consisting of \*\*\*\*\* which is prepared in the front face of the projected part equipped with insertion opening which protrudes on the both sides of the body of a holder of a disk configuration, and inserts the edge of said float arm, and the body of a holder, and \*\*\* said float arm.

[Claim 4] It is the surface level sensor characterized by being a surface level sensor according to claim 3, forming said stopper in said sensor frame, being arranged in the rotation locus of said projected part, and specifying vertical rotation of said float arm.

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**DETAILED DESCRIPTION**

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the surface level sensor for detecting the location of an oil level.

[0002]

[Description of the Prior Art] As a conventional surface level sensor, there is a thing as shown, for example in drawing 4. This surface level sensor S detects the oil level of the fuel for example, in the fuel tank 1 of an automobile, and consists of a float arm 3 and a stopper 5.

[0003] Said float arm 3 equips the end of the arm body 7 with float 9, the other end 11 is mostly bent by the right angle, and this bent other end 11 is supported by the rotation supporter 13 free [ rotation ]. The float 9 accompanying the oil-level upper and lower sides responds up and down, and this float arm 3 carries out vertical rotation.

[0004] Said stopper 5 consisted of the up-and-down stopper sections 5a and 5b, and has specified the range of vertical rotation of a float arm 3 according to specific volume, for example, a fuel full F point, and E fuel skies. 12 is contact and 14 is the resistance version.

[0005] Therefore, when a float arm 3 operates between stopper 5a and 5b, oil-level level is correctly detectable.

[0006]

[Problem(s) to be Solved by the Invention] However, with the above-mentioned structure, when the left-hand side of a tank 1 was equipped with surface level sensor S like drawing 5 and the float arm 3 and the stopper 5 had moreover been arranged at the before [ drawing skillful ] side of Sensor S, if it remained as it is, it could not adopt, for example, the arm body 7 of a float arm 3 had to be bent like drawing 6.

[0007] That is, (a) of drawing 6 is bent so that the back side may be detoured, when Sensor S is seen from the upper part, and when Sensor S is seen from a transverse-plane side like drawing 4, it bends (b) so that the lower part side may be detoured.

[0008] Thus, in any case, the float arm 3 had to be bent, the float arm 3 according to the location of Sensor S had to be used for it, the class of float arm 3 increased, manufacture assembly and parts control became complicated, and it had become the cause of a cost rise.

[0009] this invention -- the class of float arm -- not increasing -- right and left -- the surface level sensor which can choose it as all and can set up a float arm is offered a technical problem.

[0010]

[Means for Solving the Problem] The float arm which invention of claim 1 equips an end with a float, it is supported by the rotation supporter free [ vertical rotation ], and the float accompanying the oil-level upper and lower sides responds up and down, and carries out vertical rotation, In the surface level sensor equipped with the stopper which specifies the range of vertical rotation of said float arm according to specific volume A sensor frame supports said rotation supporter free [ vertical rotation ], said float arm is alternatively changed to right-and-left both directions, it considers as the arm holder which can be supported, and said stopper is characterized by having been arranged possible [ a convention of the

range ] also for any of said changed float arm.

[0011] In this surface level sensor, a float arm can be alternatively changed to an arm holder, and can be supported, and manufacture assembly and parts control become easy by making it one kind of float arm.

[0012] Invention according to claim 2 It is a surface level sensor according to claim 1, and said arm holder is characterized by having the arm attaching part of two right and left.

[0013] To the arm attaching part of two right and left of an arm holder, a float arm can be changed alternatively, and can be supported, and positive change support can be made to perform in this surface level sensor.

[0014] Invention according to claim 3 is a surface level sensor according to claim 2, and said arm electrode holder is characterized by consisting of \*\*\*\*\* which is prepared in the front face of the projected part equipped with insertion opening which protrudes on the both sides of the body of a holder of a disk configuration, and inserts the edge of said float arm, and the body of a holder, and \*\*\*\* said float arm.

[0015] In this surface level sensor, while inserting the edge of a float arm in insertion opening, by \*\*\* (ing) a float arm by \*\*\*\*\* , a float arm can be alternatively changed to right-and-left both directions certainly, and can be supported.

[0016] Invention according to claim 4 is a surface level sensor according to claim 3, and said stopper is characterized by being prepared in said sensor frame, being arranged in the rotation locus of said projected part, and specifying vertical rotation of a float arm.

[0017] With this surface level sensor, by making the projected part of an arm holder contact the stopper in which it was prepared by the sensor frame can prescribe vertical rotation certainly.

[0018]

[Embodiment of the Invention] Drawing 1 shows the perspective view concerning 1 operation gestalt of this invention. Moreover, the top view in the condition of the top view in the condition that drawing 2 (a) pulled out the float arm to right-hand side, and (b) having pulled out the float arm to the same section notching side elevation, and having pulled out (c) to left-hand side, and (d) are the same section notching side elevations.

[0019] In addition, a same sign is given to the configuration explained by said drawing 4 , and a corresponding component, it explains and the duplicate explanation is omitted.

[0020] In this operation gestalt, the rotation supporter 15 is made into the arm holder 19 supported by the sensor frame 17 free [ vertical rotation ], and the arm holder 19 can change a float arm 3 to right-and-left both directions alternatively, and can support it. Moreover, stoppers 21 and 23 are arranged possible [ a convention of the range ] also for any of the float arm 3 which chose and supported the longitudinal direction.

[0021] Specifically, said arm holder 19 is equipped with the arm attaching parts 25 and 27 of a Yuji Hidari mosquito place. The arm attaching parts 25 and 27 are arranged at bilateral symmetry, respectively, and consist of projected parts 29 and 31 which protruded on the both sides of body of holder 19a of a disk configuration, and \*\*\*\*\* 33 and 35 of the shape of a pawl prepared in the front face of body of holder 19a. The insertion openings 29a and 31a inserted in said projected parts 29 and 31 for the edge 11 of the arm body 7 of said float arm 3, enabling free attachment and detachment are formed. Said \*\*\*\*\* 33 and 35 can be made to support, when the \*\*\* slots 33a and 35a are formed narrowly a little and stuff the arm body 7 into the \*\*\* slots 33a and 35a rather than the path of the arm body 7 of said float arm 3. In the core of said body of holder 19a, penetration formation of the attaching hole 37 is carried out.

[0022] The attachment shaft 39 is formed in said sensor frame 17, and slot 39a is prepared in the tip side. The attaching hole 37 of said arm holder 19 is inserted in this attachment shaft 39, and it is attached free [ rotation ]. The omission stop of the arm holder 19 is performed by inserting the snap ring 41 in slot 39a of the attachment shaft 39.

[0023] Said stoppers 21 and 23 are formed up and down, and the stopper sides 21a, 21b, 23a, and 23b are established in right-and-left both sides, respectively. These stopper sides 21a, 21b, 23a, and 23b are arranged in the rotation locus of said projected parts 29 and 31 in case said arm holder 19 rotates

centering on the attachment shaft 39, and specify vertical rotation of the arm holder 19. The insides 21c and 23c of stoppers 21 and 23 were formed in the periphery configuration of said arm holder 19, and the corresponding curvature, and have countered the periphery of the arm holder 19 with few clearances.

[0024] And when the edge 11 of the arm body 7 is inserted in insertion opening 31a on the right-hand side of the arm holder 19 as shown in drawing 1, drawing 2 (a), and (b), and the arm body 7 is \*\*\*\*(ed) by \*\*\*\*\* 33 and 35, the float arm 3 is in the condition of having been pulled out by left-hand side. The float 9 accompanying the oil-level upper and lower sides will respond up and down in this condition, turning effort will be transmitted to the arm holder 19 through \*\*\*\*\* 33 and 35 from the arm body 7, and the arm holder 19 will rotate centering on the attachment shaft 39 of the sensor frame 17.

[0025] At this time, oil-level level is detectable in the range in which projected parts 29 and 31 contact the stopper sides 21a, 21b, 23a, and 23b of stoppers 21 and 23. The stopper sides 21a and 23b have responded to E when pulling out a float arm 3 on left-hand side. The stopper sides 21b and 23a have embraced said F points.

[0026] On the other hand, when pulling out a float arm 3 to right-hand side, as shown in (c) and (d), the edge 11 of the arm body 7 is inserted in left-hand side insertion opening 29a, and it is made to make the arm body 7 \*\*\*\* to \*\*\*\*\* 33a and 35a of \*\*\*\*\* 33 and 35. The float arm 3 could be pulled out to right-hand side, and, as for the stopper sides 21a and 23b, 21b and 23a have embraced [ by this ] said E points according to F points contrary to the above at this time.

[0027] Thus, the arm holder 3 can be pulled out in right-and-left both directions by changing the arm holder 19 alternatively and supporting it. Therefore, the class of float arm 3 can be simplified, manufacture assembly and parts control become very easy, and a remarkable cost cut can be aimed at.

[0028] In addition, with the above-mentioned operation gestalt, it can also be made the stopper sides 21a, 21b, and 23a and the configuration which specifies the range as one vertical lot of the stopper sides 21a, 23a, 21b, and 23b is prepared and a projected part 31 or a projected part 29 is made to contact this stopper side although 23b4 places are prepared.

[0029] Moreover, by preparing in other parts of surface level sensor S, stoppers 21 and 23 can make the arm body 7 able to contact directly, and they can also be constituted so that the range may be specified. Insertion openings 29a and 31a can also be made the configuration prepared in \*\*\*\*\* 33 and 35 partes basilaris ossis occipitalis, without forming projected parts 29 and 31 in this case.

[0030] Drawing 3 is the important section sectional view having shown an example of the detection structure of angle of rotation of a float arm 3. That is, with this operation gestalt, a magnet 43 is embedded in body of holder 19a of the arm holder 19, and the hole IC 45 is attached in the sensor frame 17. And the angle of rotation of the magnet 43 accompanying arm holder 19 rotation is detected by the hole IC 45. 47 is a terminal. Linearity can be acquired to the output of Sensor S by magnetizing to angle of rotation of a magnet 43, so that the magnetic field strength of a hole IC 45 may be proportional.

[0031]

[Effect of the Invention] In invention of claim 1, by being able to change a float arm to an arm holder alternatively, being able to support it, and making it one kind of float arm, manufacture assembly and parts control become easy and can aim at a large cost cut.

[0032] In addition to the effect of the invention of claim 1, to the arm attaching part of two right and left of an arm holder, a float arm can be changed alternatively, and can be supported, and positive change support can be made to perform in invention of claim 2.

[0033] In invention of claim 3, in addition to the effect of the invention of claim 2, while inserting the edge of a float arm in insertion opening, by \*\*\*\*(ing) a float arm by \*\*\*\*\* a float arm can be alternatively changed to right-and-left both directions certainly, and can be supported.

[0034] By invention of claim 4, by making the stopper in which the projected part of an arm holder was prepared by the sensor frame contact in addition to the effect of the invention of claim 3 can prescribe vertical rotation certainly.

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**DESCRIPTION OF DRAWINGS**

[Brief Description of the Drawings]

[Drawing 1] It is the decomposition perspective view of the important section concerning 1 operation gestalt of this invention.

[Drawing 2] Starting 1 operation gestalt, the top view in the condition of the top view in the condition that (a) pulled out the float arm on left-hand side, and (b) having pulled out the float arm to the same section notching side elevation, and having pulled out (c) to right-hand side, and (d) are the same section notching side elevations.

[Drawing 3] It is the sectional view of the important section which starts 1 operation gestalt and explains detection of angle of rotation.

[Drawing 4] The attachment condition of the surface level sensor concerning the conventional example is shown, (a) is a sectional view and (b) is the sectional view of a rotation supporter.

[Drawing 5] It is the sectional view where the conventional example is started and the locations of a surface level sensor differ.

[Drawing 6] The conventional example is started, bending of a float arm is shown, and the condition which bent (a) behind the surface level sensor, and (b) are the explanatory views in the condition of having bent to the said down side.

[Description of Notations]

3 Float Arm

11 Edge

15 Rotation Supporter

17 Sensor Frame

19 Arm Holder

21 23 Stopper

25 27 Arm attaching part

29 31 Projected part

29a, 31a Insertion opening

33 35 \*\*\*\*\*

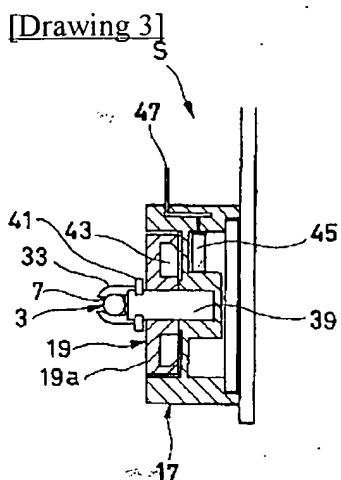
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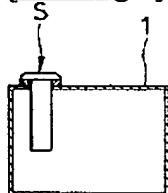
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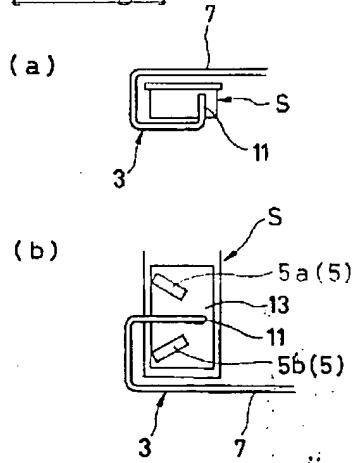
DRAWINGS



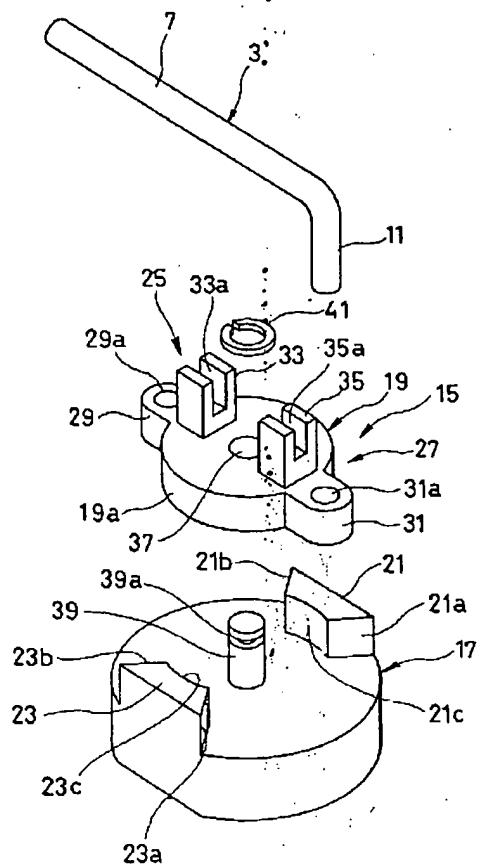
[Drawing 5]



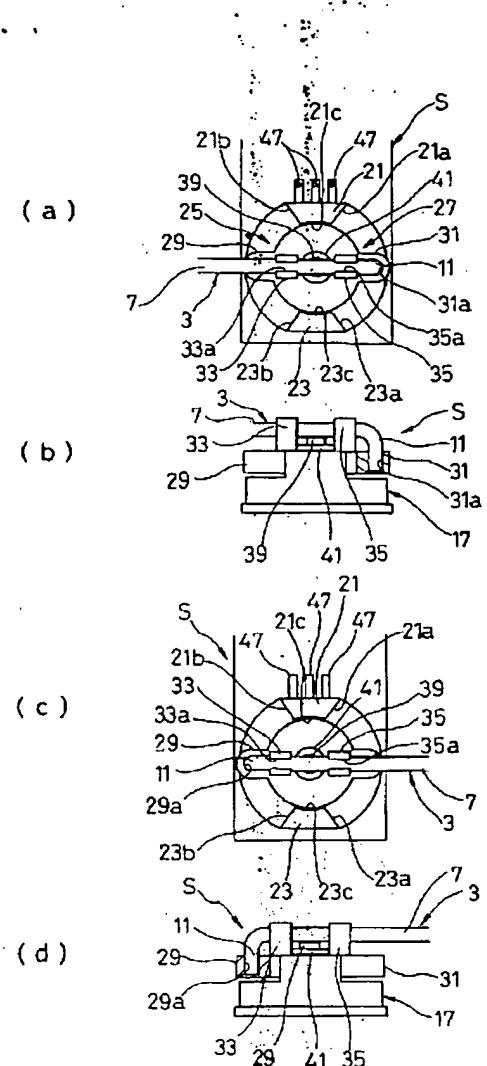
[Drawing 6]



[Drawing 1]

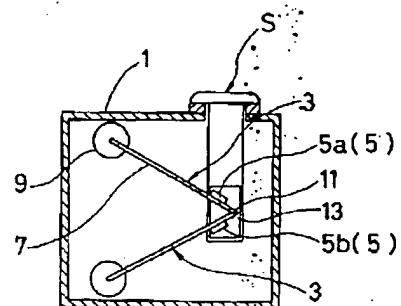


[Drawing 2]

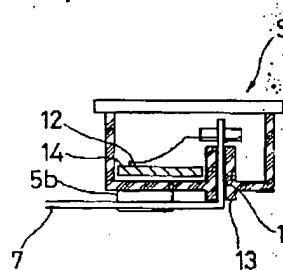


[Drawing 4]

(a)



(b)



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